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Optimization of the Bank‘s Value in Conditions of Globalisation and Permanent Crisis

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Abstract:

Purpose: *The aim of this article is to present the conceptual model of integrated optimization of bank's value, which enables the integration of the risk management process with business processes while maintaining an optimal compromise between the safety (stability) of the bank's operations and striving to maximize its value.*
Design/Methodology/Approach: *In the model used the hitherto achievements of various fields of science that are applicable in banking activities and the process of bank management, synthesized them and applied to solve contemporary dilemmas that pose a challenge in the difficult and dynamically changing economic reality.*
Findings: *As a result of the literature review, an in-depth analysis of the practice of the management methods and techniques used and the current dilemmas facing the banking sector, it was found that it was possible to formulate a financial management model for a bank, which, apart from the possibility of automation and an integrated approach to the management process, enables a sustainable and optimal development of the bank's operations.*
Practical Implications: *The aim of the model is the possibility of gaining a long-term competitive advantage in conditions of increasing globalisation, permanent threat of a crisis resulting from integration of financial markets and intensification of the contagion effect, growing competition which exerts pressure on operational efficacy, as well as shortcomings and unreliability of the markets. The model addresses the dilemmas currently facing the banking sector in view of the important structural and regulatory changes, which are of significant importance for maintaining and improving its stability.*
Originality/Value: *The model aims at providing a complex solution to such dilemmas as shaping the bank value ex ante not ex post. Its additional quality is a modular, multi-variant and two-directional structure. This structure in practice increases flexibility of model's implementation, its application in the banks which use different technological, methodological and organizational solutions, and formulation of optimization problems.*

Keywords: *Bank management model, value optimization, risk-adjusted performance management.*

JEL codes: *C61, G21, G32.*

Paper type: *Research article.*

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1. Introduction

An in-depth analysis of the causes of the last financial crisis, which started in 2008 and had a microeconomic character, allowed us to identify the main factors that undermined the foundations of the banking sector. For this reason, regulatory changes concentrated on such areas of banking activity as liquidity and capital adequacy, with special focus on strengthening the capital base (The de Larosière Group, 2009; Basel Committee on Banking Supervision, 2011). In this situation, banks, apart from natural consequences of omnipresent globalisation in business (territorial expansion, new markets, extended product range), are forced to seek long-term business strategies, which will let them meet prudential supervisory requirements while maintaining their operational effectiveness (Committee on the Global Financial System, 2018).

Therefore, an important element of every bank's operations is a capacity to assess and manage risk, to integrate it with business activity (implementation in decision-making processes), and to ensure optimum capital allocation. The abovementioned regulatory changes in this area made it necessary to capitalise banks (due to e.g. redefinition of own funds, introduction of leverage and capital buffers ratios and of liquidity standards). In consequence, the capital and its availability may have a material impact on gaining competitive advantage in the banking sector (European Banking Authority, 2020). Due to the limited availability of capital, it is necessary to accumulate it. On the other hand, however, expectations of different stakeholders are in manifest contradiction with such a solution. Therefore, a possible solution that may contribute to reaching a compromise between the bank's stakeholders and the supervisor is the optimal capital allocation that will ensure the maximization of the bank's value while maintaining its financial stability.

The said prudential limitations and contradictory goals of different groups of bank stakeholders have generated motivation to build an integrated bank management model, which would ensure the compromise mentioned above, as well as – first and foremost – long-term competitive advantage of a bank in conditions of globalisation and threat of permanent crisis, regardless of the fact whether the crisis is caused by turbulences in financial markets, public finance crisis or the coronavirus pandemic. Essentially, this model is supposed to produce a qualitative change in the approach to bank management as it will allow us to shape the bank value *ex ante*, not – as is usually the case – *ex post*.

2. Effectiveness of Bank Operation – Literature Review

Over the past few years, significant structural and organizational changes have occurred in the banking sector. They are very important in terms of maintaining and improving stability of the sector. Among them, there are structural changes pertaining to the organization of macro- and micro-prudential supervision (Zaleska, 2019), which implement a holistic approach to the problem of financial markets

integration and related risk (European Systemic Risk Board, 2014). There are also regulatory changes in prudential requirements for individual banks, which the banks have to fulfil from the point of view of their activity, or mere existence (Osiński, Seal, and Hoogduin, 2013). In this context, if we aspire to shape the bank value reasonably, the problem of its operation effectiveness must not be ignored.

Effectiveness is one of the key concepts in management and economy. The literature which refers to its very essence provides a wide range of possible definitions and interpretations of this concept, and emphasizes its multi-faceted character. PA. Samuelson and W.D. Nordhaus (2009) point out that effectiveness denotes the most effective use of a community potential in the process of eliminating deficits and catering for people's needs. On the other hand, J.A.F. Stoner, R.E. Freeman and D.R. Gilbert (2009) claim that effectiveness is only a measure of operation efficiency and efficacy. It shows the extent to which set goals are achieved. These definitions are not the only examples of a semantic misunderstanding.

The literature often indicates a different view on effectiveness, which is shown as efficiency and/or efficacy. This opinion was presented already at the beginning of the 20th century by H. Emerson (1912), author of the idea of scientific management, who claimed that effectiveness is the right thing done in the right way. This view was also partially shared by P. Drucker (2006), who held that efficiency, i.e., doing the right thing in the right way is an important criterion of assessing managers, but effectiveness, i.e., doing right things is the most important factor. In this context, it can be concluded that effectiveness has no unambiguous empirical content while its connotation is finally determined by the context of the analysis or of additional comment (effectiveness of substitution, investment, etc.). The proper sense of this concept results from the specific character of activity which is subject to evaluation, from the character of an entity which carries out evaluation, or purpose of the analysis, etc. With a view to the aim of examination of effectiveness and the available data sources, the test methods can be classified as follows:

- classical effectiveness ratios, including: profitability ratios, margin ratios, result load ratios, cost performance ratios;
- parametrical methods including: SFA (*Stochastic Frontier Approach*), DFA (*Distribution-Free Approach*) and TFA (*Thick Frontier Approach*);
- non-parametrical methods including: DEA (*Data Envelopment Analysis*) and FDH (*Free Disposal Hull*);
- value added methods including: EP (*Economic Profit*), SVA (*Shareholders Value Added*), EVA (*Shareholders Value Added*) and MVA (*Market Value Added*);
- an adjusted performance methods based on the RAPM (*Risk Adjusted Performance Measurement*) concept.

Most often, it is the last two groups that are applied in practical bank management. Their combination allows us to formulate and operationalise strategic goals, considering the bank stakeholders' expectations.

Value added methods are based on the 19th century Alfred Marshall's theory, which holds that an entrepreneur should consider the cost of gained capital in the assessment of his/her activity (Marshall, 1890). Some claim that the origins of this theory go back to earlier times. This problem can be found – among others – already in the mid-19th century in D. Ricard's works, and even at the end of the 18th century in R. Hamilton's studies (Scarlett, 1997; Biddle, Bowen, and Wallace, 1999). In his works, Marshall improved performance measurement by taking into consideration the opportunity cost, which he defined as effects of alternative investment. He also indicated that the book profit does not include the opportunity costs and recommended replacing it with residual profit. Nowadays, in management theory and practice, Value Based Management systems (VBM) – which rely on the concept of residual profit – have become very popular. In such management systems, decisions are based on the criteria oriented towards maximization of the value of invested capital. The beginnings of VBM date back to the 1980s (Young and O'Byrne, 2000).

A very important factor which affects all the spheres of bank operation and in consequence – its effectiveness – is risk. Its complex character creates considerable difficulty in identifying all factors affecting its scale, and in determining their impact on bank effectiveness. This problem is additionally complicated by the phenomena occurring in the global economy, which generate new kinds of risk. This makes it necessary to identify the determinants for each kind of risk individually so that its specific character could be properly included. This, in turn, increases the degree of complexity of mutual interrelationships, and in consequence, makes it quite difficult to determine the scale of their impact on effectiveness. (Altunbas, Carbo, Gardener, and Molyneux, 2007). Before the *Basel II* regulatory package was introduced, there were no uniform standards for risk management in banks (Basel Committee on Banking Supervision, 2004). Different banks applied different risk management methods, the degree of advancement of which was often determined by the cost level. Introduction of these regulations made it necessary for banks to apply uniform standards.

Consequently, the banks had to incur greater costs related to the implementation and maintenance of these methods, which, in turn, decreased in the effectiveness of their operation. (Siljeström, 2013). A solution was found in the implementation of an integrated approach to risk management, which, on the one hand, allowed for greater effectiveness, while – on the other hand – contributed to more effective risk management on a scale of the entire bank (Bevan, Freiman, Pasricha, Samandari and White, 2019). Introduction of the CRR/CRDIV regulation (implementation of *Basel III* package) resulted in the implementation of a number of additional requirements, which considerably increase the complexity of capital management process and

capital allocation. The latter cannot be carried out in an optimum way without an integrated risk management system (Basel Committee on Banking Supervision, 2011). Therefore, banks which have integrated risk management systems will gain a competitive advantage over those which still have to introduce such systems. This competitive edge is due to at least two reasons, i.e. greater effectiveness of the risk management process and sustainable increase of bank value. Sustainable increase of the bank value is connected with optimum capital allocation, which determines an adequate level of risk taken in long-term perspective and thereby prevents an excessive scale of risk.

From the abovementioned point of view, Risk Adjusted Performance Measures deserve special attention. In a practical aspect of the bank management process, these measures let us integrate effectiveness, risk and capital management with business activity (Modigliani and Modigliani, 1997; Saita, 2007; Baer, Mehta, and Samandari, 2011). They take into account the so called risk capital (depending on the adopted solution, expressed by means of economic capital, internal capital or capital requirement). In practice, RAPMs are a modification of the classical Return on Equity (ROE) ratio. This modification, depending on the method of risk presentation, brought about new measures such as RAROC, RORAC, or RARORAC, to mention only a few (Sharpe, 1975; Matten, 2000).

The classical ROE is a profit to capital ratio and it does not include any information about the scale of risk exposure. In this context, RORAC (Return on Risk-Adjusted Capital) can be defined as a measure of real profitability as it reflects the principle that higher risk transactions require a higher level of capital to hedge them than lower risk transactions. The method of calculation of the required capital level may be based not only on the asset value volatility (e.g. *Value at Risk* /VaR/) but also on the endangered profit value (taking into account the risk-free rate or capital cost), or the expected return on equity (Buch, Dorfleitner, and Wimmer, 2011). There is also an approach based on internal capital and capital requirements. RAROC (*Risk-Adjusted Return On Capital*), on the other hand, is an ideal tool for measuring the effectiveness of individual transactions, bank operation areas, or organizational units. It helps to calculate profitability on the level of individual transactions, and then – by aggregation – to perform a comprehensive profit assessment on the level of the entire bank and also on bank's intermediate levels, making it possible to transfer the strategic goals onto the operational level (Zaik, Walter, Kelling, and James, 1996).

In the context of the abovementioned problems, and also in view of increasing globalisation, permanent threat of a crisis resulting from integration of financial markets and intensification of the contagion effect, as well as growing competition which exerts pressure on operational effectiveness, banks were forced to seek long-term business strategies in order to ensure that prudential requirements are met while profitability and operational competitiveness are secured (Adam, 2008). In other words, to ensure survival. Considering the causes of market shortcomings and

unreliability, post-crisis conclusions and the complex character of conditions in which banks operate, survival is possible thanks to gaining a competitive advantage, which, in the present circumstances, requires us to ensure an optimum compromise between apparently contradictory objectives: security of bank operation and maximization of bank value (Kruger, 2011). Therefore, we face a question whether a bank can survive and develop in the conditions of numerous limitations and of the abovementioned phenomena, increasing its operational effectiveness and maximizing its value, while meeting the expectations of all the stakeholder groups.

3. Objectives and Assumptions of the Model

The main goal of the constructed model is to enable integration of the risk management process and bank's business activity. In principle, this should facilitate a compromise between operational safety of a bank (depositors) and its profitability (increase of bank value desired by the investors). This integration meets the expectations of banking supervision and results from the post-crisis conclusions, which indicated an unwanted independence of the sale process from the risk management system. In result, transactions were made without a reliable assessment of the transaction-related risk, which in the case of unfavourable events on the market usually led to loss materialisation (European Commission, 2010; Słomka-Gołębiowska, and Urbanek, 2014). Moreover, the integrated bank management system limits to some degree an unjustified internal asymmetry of information and contributes to reducing the uncertainty level, which plays a special role in the decision-making process (the higher the uncertainty level, the lower the probability of making an optimal decision, and consequently, the lower the bank's value).

The purpose of the abovementioned integration is to achieve effective bank management and bank value optimization at the same time. The latter is a necessary condition to ensure a lasting competitive edge. Bank value should be created taking into account all the prudential regulatory requirements, as well as the established risk appetite. Value optimization mechanisms should – in keeping with the boundary conditions – have their impact on internal demand by means of value drivers. A value driver is the price of funds transfers, which reflects the mismatch between the balance sheet structure (a gap between the current and target structure) as well as the mismatch between the level and structure of risk. At the same time, it is intimately connected with the motivational system (the amount of benefits depends on the mismatch between the balance and risk structures) and it should effectively affect the operations undertaken by the sales structures. In consequence, the balance sheet structure and the risk level should aim at achieving the target values, and thereby ensure the achievement of the optimum bank value. It should be noted that the optimum value denotes here the maximum bank value at the admissible risk level. Subjecting business activity to the optimization mechanisms should contribute to optimum capital allocation, and thus reduce the ineffectiveness level in the entire bank.

Meeting the abovementioned objective requires us to adjust the system of the funds transfer pricing using the so called dynamic margin, which will be shaped not only by the level of current internal demand, but also by the scale of risk taken and the degree of limits utilization.

The designed model should enable automation of the bank management process in the field of shaping the balance sheet structure and risk level. It is obvious that it is mainly influenced by the level of technological advancement of a given bank. However, assuming that a bank uses adequately automated partial processes, it is possible to implement the optimizing algorithms in the IT systems, which would be responsible for shaping the internal demand through the funds transfer rates. Such a solution would not only address the expectations related to the new regulations in the field of capital requirements due to operational risk (Koleśnik, 2018), but also eliminate the weakest link in the decision-making process, namely the human factor with all its shortcomings: lack of adequate knowledge, inaccurate evaluation of reality, precarious conditions of uncertainty and pressure of fear, or lack of possibility to quickly assess the actual risk level in a reliable way.

Due to a different scope of demand for information and different area of responsibility at individual management levels of bank, the model must have a modular structure. The criterion for distinguishing the modules will be the decision-making levels participating in the risk management process and the management of the bank's assets and liabilities. In the adopted solution, the output data from the superior module will – at the same time – serve as input parameters for the inferior module. The modular structure of the module is supposed to ensure its gradual implementation if any technological, methodological or organizational barriers occur, which could make it impossible to implement the module as a whole.

It should also be noted that the order of implementation of individual modules may be assumed to be any order. Furthermore, individual modules can be used to take decisions independently from the other ones. In such a case, however, it may substantially interfere with the process of bank value optimization, and thereby undermine the assumption made previously. The assumption of the modular structure is therefore supposed to include the principle of proportionality, organizational structures diversity, the level of bank's technological development, its management methods and the specific character of its risk management system.

A two-directional operation of the model is also assumed. Until now, the presented assumptions referred to application of the model in the process of optimized management of bank value. The optimization mechanism can also be used in the projection of the target bank value or of the admissible risk level, on the basis of the current structure and volume of sales. This can provide a basis for a change of the bank business strategy and/or the risk management strategy, including adjustments to the pricing policy in the case of enduring mismatch between the target (optimum) and current balance sheet structure. This issue is important due to the fact that the

impact of external demand or supply factors in the process of bank management should be taken into consideration.

In summary, the aim of an integrated bank value management model is to fulfil prudential regulatory requirements and optimize the bank value at the same time. In order to ensure consistency of the model's construction with the current concepts and methods in the field of bank management, the additional goals of the model are:

- to ensure integration of the risk management process with the bank business activity, using the concept of Risk Adjusted Performance Measure (RAPM) and aggregated risk measures;
- to ensure a modular and multi-variant model structure, which will enable application of the model in the banks characterised by different business profile and different level of technological advancement;
- two-directional operation of the model, which would not only optimize the bank value but also support the process of strategic bank management (planning).

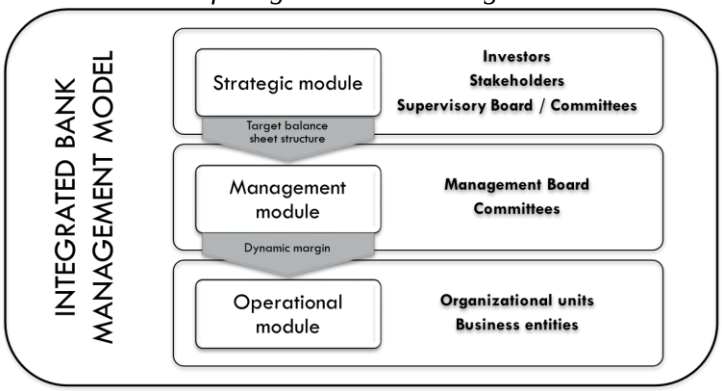
4. Modular Structure of the Model

The effectiveness of model operation and – first and foremost – ensured realisation of set goals is based on the following premises:

- demand and supply mechanism is the main factor shaping the benefits level;
- the main factor which stimulates sales of different products is the amount of benefits (transmission channel of internal demand volume);
- the basis for the two-directional optimization mechanism (dynamic margin and target balance sheet/transaction structure) is Markowitz's portfolio theory (Markowitz, 1952);
- RAPM measures (Schroeck, 2002; Resti and Sironi, 2007; Matten, 2000) are an indispensable element of two-directional optimization;
- along with the supervisory regulatory requirements, the key issue is to guarantee adequate risk diversification, whose lack was one of the factors which contributed to the occurrence and intensification of the crisis;
- the level of dynamic margin in the funds transfer pricing system is determined with regard to the mismatch between the balance sheet structure and the target structure, transaction risk and the RAPM concept.

Regardless of the adopted operational strategy, in every bank there occurs a mismatch between the current and planned balance sheet structure. In this case, the problem lies in the possibility of eliminating the mismatch.

Figure 1. *General structure of integrated bank management model*



Source: *Authors' elaboration.*

The issue described by Markowitz with regard to the stock portfolio is analogous to the dilemma facing every bank, what should the balance sheet/transaction structure be like in order to maximize the bank value while maintaining the admissible risk level. We can therefore adopt the concept proposed by Markowitz to determine the target structure, which involves the profitability of individual transactions and risk related thereto (planning). Moreover, on the basis of the current balance sheet structure and target risk level, this mechanism can be used to determine the dynamic margin (transmission of strategic goals and financial plans onto the operational level). It should be noted, however, that the original Markowitz's model had the following shortcomings:

- estimation of rates of return and standard deviations of different securities on the basis of historical data,
- sensitivity of results to even relatively small changes in the range and period of historical data.

Therefore, a modified approach to the abovementioned problems will be applied in the model so that the shortcomings of the portfolio theory can be eliminated while the general operational principle is maintained. On the other hand, the risk and risk estimation method will depend primarily on the level of bank technological advancement with regard to determination of internal capital or regulatory capital requirements. The RAPM measures will be applied both in the planning process and in the transmission of the target structure onto the operational level later on, as well as in determining the bonus to be paid to the sellers.

Modular structure of the model facilitates its implementation in different processes and makes it possible to implement individual modules independently. Practically, the model can be implemented in every bank, regardless of the practice adopted with regard to risk measurement (different risk estimation methods), methods to examine

effectiveness and limit the risk run by the institution, and of the result allocation methods or the motivational system.

4.1 Strategic Module

The aim of the strategic module is to determine the target balance sheet/transaction structure on the basis of information coming from the bank stakeholders and from the supervisory board (profitability, capital availability, risk appetite and tolerance), taking into account the business strategy and admissible risk limits adopted by the bank to ensure its safe and stable operation (regulatory and internal prudential limits). This structure reflects an optimum combination of individual components of the balance sheet transaction, in keeping with the boundary conditions (limits), in view of maximization of the income to risk ratio (maximization of bank value). The term 'income', as used in the model, refers to the result of the bank activity/core business shown in the profit and loss account. It is this component of bank's result that is subject to optimization, being the principal determinant of the profit achieved by the bank, while the remaining items on the profit and loss account will be treated each time as an exogenous variable (constant, in relative or absolute terms, estimated on the basis of the current values of these elements).

Essentially, the problem of determining the optimum balance sheet/transaction structure is analogous to the problem of selecting assets for the investment portfolio described by H. Markowitz in his portfolio theory. Therefore, the assumptions for the model will be used taking into account the indispensable adjustments resulting from the specific character of the problem in question.

The indispensable input parameters of the module are income and risk. In the case of a bank, they are determined – directly or indirectly – by the stakeholders/supervisory board in the form of the rate of return expected by the stakeholders and risk appetite. These parameters are absolutely necessary to determine the minimum acceptable value of the income/risk ratio, which synthetically reflects also the stakeholders' approach to the bank activity (safer or risky bank activity). They may be determined in different forms, depending on the practice adopted by a given bank. Nevertheless, most often they have the form of the ratios: ROE (rate of return/profitability), which contains information about the volume of capital and financial result as well as the total capital ratio, reflecting the scale of admissible risk (capital at risk) in relation to bank's own funds. Therefore, these parameters include information on the basis of which we can construct the profit/risk ratio, expressed by the following formula:

$$ZR = \frac{Z}{R} \tag{1}$$

where: ZR – expected net profit to acceptable risk level,
Z – net profit,
R – value of capital at risk.

Since we need to decompose the net profit into individual transactions/balance sheet items, it is indispensable to adjust the above formula with the profit and loss account constant elements (from the model's point of view) and the tax rate. This is necessary because income is determined and settled without taking tax into account. Therefore, the adjusted formula can be presented in two ways, depending on the adopted method of including constant elements (presentation of values or share of the elements' values in the result of the bank/core activity):

$$DR = \frac{Z - (1-T) * W_{dp}}{(1-T) * R} \quad (2a)$$

$$DR = \frac{Z}{(1-T) * (1-W_u) * R} \quad (2b)$$

where: DR – expected income to acceptable risk ratio,
W_{dp} – total result achieved from the activity of the bank, excluding the result obtained from core activity,
Z – net profit,
R – value of capital at risk,
T – tax rate,
W_u – share of the remaining bank activity in the result obtained from core activity.

This way, we obtain a general form of the function which expresses the target income/ risk ratio in the context of bank activity parameters expected by the stakeholders. At the same time, the function determines the admissible level of risk taken by the bank and the expected income value. However, it is necessary to decompose the elements of this formula into the individual balance sheet/transaction items whose structure is to be determined. It should be also remembered that the problem in question concerns not only the assets on the balance sheet, as is the case in the portfolio theory (where the source of financing of investment portfolio is an exogenous parameter). Bank's profit is the difference between the revenues and the costs generated both by the active (assets) and passive (liabilities) side of the balance sheet, as well as by the off-balance sheet items.

The problem lies also in the method of determining profitability of the product/transaction, which is usually sensitive to the applied source of financing, not to mention the difficulty in defining it for the passive products. Furthermore, the character of a balance sheet item (active/passive) will not always determine whether a given item generates costs or revenue (e.g., corporate current account generates revenues/commissions which often exceed costs/cost of interest). Therefore, in order to determine transaction profitability, we should use the Funds Transfer Pricing (FTP) rates, which allocate the deposit and credit margin to different products on the basis of the price of money. This way, each transaction, regardless of its balance sheet character, has its allocated income, on the basis of which its profitability rate

can be established (naturally, including also other revenues, not only the ones which bear interest).

Another problem connected with decomposition of elements of the described functions is the scope of decomposition, which will depend on the solutions adopted by a given bank. Instead of the basic division into different kinds of balance sheet items, this scope may include more detailed divisions (products broken down in terms of client segment, kind of products, business units, etc). However, it should be remembered that the adopted decomposition has a direct impact on the form of the maximizing function (the number of components), and that it should be absolutely reflected in the possibility of determination of profitability rate and the risk run for the adopted scope of decomposition.

With the above in mind and taking into consideration the assumptions of the portfolio theory, the problem of bank value maximization can be presented in the following formula:

$$D = B * \left(\sum_{i=1}^{n} x_i Ds_i + \sum_{j=1}^{m} y_j Ds_j + \sum_{k=1}^{l} z_k Ds_k\right); \quad D \rightarrow max \tag{3}$$

where:
- D – income in terms of value,
- B – value of balance sheet total,
- x_i, y_j, z_k – share of a given component of assets, liabilities and off-balance sheet items, respectively, in the balance sheet total,
- Ds_i, Ds_j, Ds_k – profitability rate of transaction/item/product.

Due to the aim of the constructed model, the function will be subject to maximization in certain boundary conditions. Some of them result from the properties of the function components:

$$\sum_{i=1}^{n} D_i + \sum_{j=1}^{m} D_j + \sum_{k=1}^{l} D_k \geq \frac{z}{(1-T)*(1-W_u)} \tag{4}$$

$$\sum_{i=1}^{n} R_i + \sum_{j=1}^{m} R_j + \sum_{k=1}^{l} R_k \leq R \tag{5}$$

$$\sum_{i=1}^{n} x_i = \sum_{j=1}^{m} y_j = \sum_{k=1}^{l} z_k = 1 \tag{6}$$

$$0 \leq x_i \leq 1;\ 0 \leq y_i \leq 1;\ 0 \leq z_i \leq 1 \tag{7}$$

where: R_i, R_j, R_k – value of capital at risk of given transaction/item/product.

In order to include the other assumptions of the model, it is necessary to formulate additional boundary conditions. For the CRR/CRD IV regulatory capital requirements:

$$\frac{Fw}{12{,}5 * (8\% + BK)} \geq R \tag{8}$$

where: Fw – bank's own funds (total of Tier I capital and Tier II capital),
BK – currently binding capital buffers (%).

On the other hand, the boundary conditions for risk diversification will depend on the profile of bank activity and on the adopted decomposition of the target function components. They refer to the risk limits system in different – used in a given bank – cross-sections of risk appetite structure (e.g., acceptable structure of internal capital or limits of engagement in different products, etc).

$$L_{di} \leq u_i \leq L_{gi} \tag{9}$$

where: u_i – share or value of a given component or a group of components *i*,
L_{di} – bottom limit for a given component or a group of components *i*,
L_{gi} – upper limit for a given component or a group of components *i*,

The result of equation (3), taking into account all the boundary conditions, is the structure of balance sheet/transaction, which will ensure maximization of income at the admissible risk level. Especially in the banks which are not technologically advanced, the need to estimate profitability and value of capital at risk for all the decomposition elements may pose a problem. Another difficulty, raised also with regard to the portfolio theory, is the possibility of using historical data for the purposes of estimation and the related sensitivity of the model to a change of initial conditions (scope and choice of a sample to be estimated). However, this problem may be reduced to a minimum if we apply a method of profitability and risk estimation other than the historical one (e.g. Monte Carlo simulations, scenario analyses, or application of the Autoregressive Integrated Moving Average /ARIMA/ using long-term horizons in order to eliminate the influence of economic fluctuations).

4.2 Management Module

The main purpose of management module is to determine the level of dynamic margin, which is an element of funds transfer price and should in principle give preference to products/transactions desired from the point of view of the target balance sheet structure. This level is determined on the basis of mismatch between the current balance sheet/transaction structure and the target structure defined by means of the strategic module. This difference reflects the volume of internal demand in terms of bank value maximization. On the other hand, the level of dynamic margin, which is determined for each transaction being made and each time depends on the size of the mismatch, is an element of the motivational system and, in principle, is supposed to stimulate the shaping of the desired supply by the sales structures.

The size of mismatch of the balance sheet/transaction structure is the main – although not decisive – factor shaping the level of dynamic margin. Time-consuming of transaction is an indispensable element affecting this level due to the

possibility of preference offered by sales structures to the transactions which generate comparable benefits but require less labour (e.g., choice of deposit products in telemarketing activity instead of credit products). It is also necessary to consider the income/risk ratio. Should its value fall below the target level, bank value maximization will be impossible.

Transfer prices in the bank are usually established on the basis of the price of money, to or from which a given margin – being a component of the structural margin – is added or deducted, respectively. In order to obtain an effective impact of the module in question and of the entire model of bank value maximization, it is necessary to modify this approach. In consequence, the price of money will be only an element of result allocation and not a reference point for establishing transfer rates. It is also connected with a change in the method of presenting transfer rates for corporate entities in the IT system. The change consists in abandoning the prices offered by the bank's central entity (treasury department) and replacing them with the margin proposed for the sale of a given product. It is this margin that is the object of the constructed model.

At the beginning of the description of this module, 'margin' was described by the term 'dynamic'. This is due to the fact that its level presented in the FTP systems directly depends on the abovementioned factors. This does not mean, however, that its level may be unlimited. The funds transfer pricing system assumes that the total of deposit, credit and structural margin for all the transactions/products must not exceed the value of the margin achieved by the entire bank. In the context of the model, our interest is primarily focused on the deposit and credit margin, whose value is indirectly conditioned by the level of the structural margin. From this point of view, the deposit and credit margin may not disturb the balance between deposit and credit activity. Thereby, in principle, the margin on an accepted deposit which can be achieved by a business entity cannot be higher than the credit margin obtained on the sale of credit. It should be remembered that the structural margin must cover the transaction-related risk and make it possible for the treasury department to work out a positive result. As mentioned above, it is also important that the level of the defined maximum margin, including the structural margin should be updated in proportion to the changes in the level of the margin obtain by the entire bank.

Essentially, dynamic margin is supposed to stimulate operations of sales structures aiming at effecting transactions which are desired in view of the optimum balance sheet/transaction structure. Therefore, the algorithm determining the dynamic margin level should take into account the mismatch between the current and target balance sheet-transaction structure, time-consuming of the transaction as well as income/risk ratio. For transaction/product, the abovementioned elements will be defined and calculated in the following way:

$$N_i = max\left(0; \frac{N_{di} - N_{ai}}{N_{di}}\right) \quad (10)$$

$$P_i = \frac{t_i}{t_{max}} \quad (11)$$

$$DR_i = \frac{D_i}{R_i} \quad (12)$$

where: N_i – shortage of transaction/product *i* expressed as a percentage,
N_{di} – target share of transaction/product *i* in the structure,
N_{ai} – current share of transaction/product *i* in the structure,
P_i – time-consuming ratio for product/transaction *i*,
t_i – total time necessary to sell product/transaction *i*,
t_{max} – time necessary to sell the most labour consuming product/transaction,
DR_i – income/risk ratio for product/transaction *i*,
D_i – income generated by product/transaction *i*,
R_i – risk level for product/transaction *i*.

First, the available margin rate for a given type of product must be established (such rates should be established for each element of decomposition in the strategic model). The margin rate should not be confused with the maximum margin (deposit and credit margin), which can be obtained by a business entity mentioned above.

$$S_{max\,i} = M_{max} * P_i * N_i \quad (13)$$

where: $S_{max\,i}$ – margin rate available for product *i*,
M_{max} – maximum deposit and credit margin established in the bank.

This value reflects the maximum margin achievable by an entity considering the current mismatch of the structure (level of demand) and time-consuming for a given transaction/product. Assuming that the bank is not yet engaged in a given product ($N_i = 1$) and is characterised by the maximum labour consumption ($P_i = 1$), the rate will equal the maximum level of deposit and credit margin fixed by the bank.

The above formula, however, does not reflect the value of the effected transaction, which has an impact on the level of the structure mismatch. More importantly, it does not refer to the income/risk ratio, which is key from the point of view of the entire model. Should S_{max} margin be linked with the transaction – regardless of its value – a tendency to conclude transactions of the greatest possible value would be created, which would not always be a desired outcome if proper transaction granularity was to be maintained. In order to eliminate possible irregularities in this area, an assumption was made that the margin rate decreases in proportion to the decreasing mismatch, while its value is determined as an arithmetical average of the two S_{max} values, before and after the transaction is effected.

$$W = \frac{M_{max} * P_i}{V_d} \tag{14}$$

$$S_t = max\left(0; \frac{2 * S_{max\,i} - V_i * W}{2}\right) \tag{15}$$

where: W – adjustment ratio for a given type of transaction,
V_i – value of effected transaction *i*,
V_d – target value of transactions/products of a given type,
S_t – margin for a given transaction after transaction value is taken into account.

The margin determined in this way is still subject to adjustment due to the level of income/risk ratio. In principle, the adjustment is supposed to give preference to the transactions of higher value of this ratio as compared with the expected level and decrease the margin due when the ratio is lower than expected. The adjustment is necessary to ensure the mechanism of sales structures simulation to make transactions of the desired income/risk ratio so that the target structure reaches an optimum level from the point of view of bank value maximization. The target level determined for this type of transaction, when formulating the target function in the strategic model, provides a point of reference for establishing the desired level of this ratio. In principle, if a part of transaction of an income/risk ratio lower than the target one has already been effected, the subsequent transactions should show a higher ratio so that its final value is not lower than the target one for a given group of transactions. On this basis, an equation can be formulated and the desired level of this ratio for other transactions can be calculated:

$$N_i * DR_t + (1 - N_i) * DR_a = DR_i \tag{16}$$

$$DR_t = \frac{DR_i - (1 - N_i) * DR_a}{N_i} \tag{17}$$

where: DR_t – desired income/risk ratio level for a given type of transaction,
DR_a – current income /risk ratio level calculated on the basis of the transactions which have been already effected,
DR_i – target income/risk ratio level for a given type of transaction,
$N_i > 0$ – otherwise $DR_t = 0$.

The final formula for the parameter which controls the dynamic margin level, taking into account necessary adjustments, has the following form:

$$S_{tdr} = min\left[M_{max};\ S_t * max\left(0;\ \frac{DR_p - DR_t}{DR_i}\right) * \frac{Rs_i}{Rs_p}\right] \tag{18}$$

where: S_{tdr} – parameter controlling the level of dynamic margin,
DR_p – income/risk ratio for the transaction being effected,
Rs_i – target risk ratio for a given type of transaction/product,
Rs_p – risk ratio for the transaction being effected.

The last element of the formula presented above should essentially reduce the possibility of effecting transactions of a risk ratio higher than the target ratio for a given type of transaction/product. Therefore, it gives preference to the transactions which are characterised by a lower level of the ratio than the target one.

Due to the fact that benefits provide a direct stimulus for sales structure operations, it is necessary to convert the obtained value of the parameter controlling the level of the dynamic margin into the benefits value.

$$Pr_i = Pr_{max} * \frac{S_{tdr}}{M_{max}} \tag{19}$$

where: Pr_i – benefits amount for transaction *i*,
Pr_{max} – maximum benefits amount to be achieved by a business entity.

The final value of dynamic margin is calculated as a ratio of the amount of benefits generated by a given transaction to its nominal value. The dynamic margin calculated in this way is – at the same time – a transfer rate, used to allocate the results achieved by business entities. It is further divided according to the solution adopted by the bank, among others into the part that is due to the seller who made the transaction.

$$DS_i = \frac{Pr_i}{V_i} \tag{20}$$

where: DS_i – value of dynamic margin.

General rules which govern operation of such a mechanism, in accordance with the assumptions formulated with regard to the model, are the following:

- greater time-consuming of the transaction results in a higher dynamic margin which is possible to achieve for a business entity;
- bigger mismatch between the current and target balance sheet/transaction structure ensures a higher margin while the margin decreases as the mismatch diminishes;
- lowering of the margin level in result of lower mismatch is proportional while the value of the final margin rate depends on the value of the transaction being effected (the scale of mismatch reduction);
- due to the abovementioned mechanisms, transactions with a considerable mismatch between the current and target structure, as well as transactions with the risk level lower than the target one, are given preference;
- the module generates a higher margin value for transactions with a higher income / risk ratio than the value desired from the point of view of the target level, but not higher than the maximum deposit and credit margin established by the bank.

In result, the dynamic margin becomes a tool for strategic goals transmission onto the operational level and stimulates the operations of the sales structures which ensure that these goals are achieved. Nonetheless, it should be noted that the dynamic margin mechanism should be applied with regard to the products which are not promoted by e.g., advertising campaigns. Promoted products usually have their own incentive budget which is governed by different rules, and therefore they will not always meet the profitability criterion (especially at the beginning, when a product is being offered).

4.3 Operational Module

The aim of the operational module is to stimulate the sale of the products expected from the point of view of the target balance sheet structure, by means of the dynamic margin mechanism. The module should be regarded as a concept of implementation of the results derived from other modules on the operational level, and it primarily refers to the technological area. The concept therefore entails modifications which need to be introduced so that the operations undertaken by the sales structures are focused on making the share of balance sheet/transaction items compliant with the optimum structure.

In order to eliminate the abovementioned preference-related irregularities, observed during the last global financial crisis, the mechanism of benefits pay-out to the sales structure should also be modified. This is aimed at reducing the pro-cyclical behaviour in the field of product sale but also at encouraging participation of the sellers in covering the losses which have materialised. Proposal of such a system of benefits pay-out is based on the accounts of individual sellers. Every individual account would have three sub-accounts to book: reserves, deposits and bonuses. Naturally, these terms are arbitrary while the mechanism of booking and distributing benefits would be as follows:

- materialized losses would be covered from the reserve sub-account related to the transactions effected by a given seller, up to the amount of benefits booked earlier and connected with these transactions (in the case of deficit in this sub-account – record of seller's liability);
- benefits due to a given seller in a given month would be booked in the deposit sub-account;
- on the basis of the ratio of risk generated by a given seller to the value of transactions effected by this seller, the required balance on the reserve sub-account would be determined as a product of the calculated ratio and the value booked in the deposit sub-account, and then a suitable amount would be transferred from the deposit sub-account into the reserve sub-account (covering a possible liability) or a surplus (if applicable) would be returned into the deposit sub-account;
- once the reserve amount is established, the total amount collected in the deposit sub-account would provide a basis for determining the monthly

amount of benefits to be booked in the bonus sub-account (benefits to be paid out in a given month) on the basis of average weighed duration of the transactions concluded by the employee and of his/her risk-adjusted efficiency.

Formulas necessary for this mechanism of booking and settling benefits can be presented as follows:

$$SR = \frac{R_w}{V} * SL \tag{21}$$

$$SP = \frac{SL_r}{D * 12} * \frac{DR_p}{DR_{si}} \tag{22}$$

where:
- SR – required balance on the reserve sub-account,
- R_w – risk expressed as an amount allocated on the transactions effected by the seller,
- V – value of all transactions effected by the seller,
- SL – balance on the deposit sub-account after all benefits due for a given month were booked,
- SP – benefits amount to be paid out for a given month,
- SL_r – balance of the deposit sub-account after the balance on the reserve sub-account was adjusted,
- D – average weighed duration of all transactions effected by the seller, expressed in years,
- DR_p – income/risk ratio resulting from transactions effected by the seller,
- DR_{si} – average weighed income/risk ratio (weighed by the transaction value), calculated on the basis of target values of this ratio for the types of transactions effected by the employee.

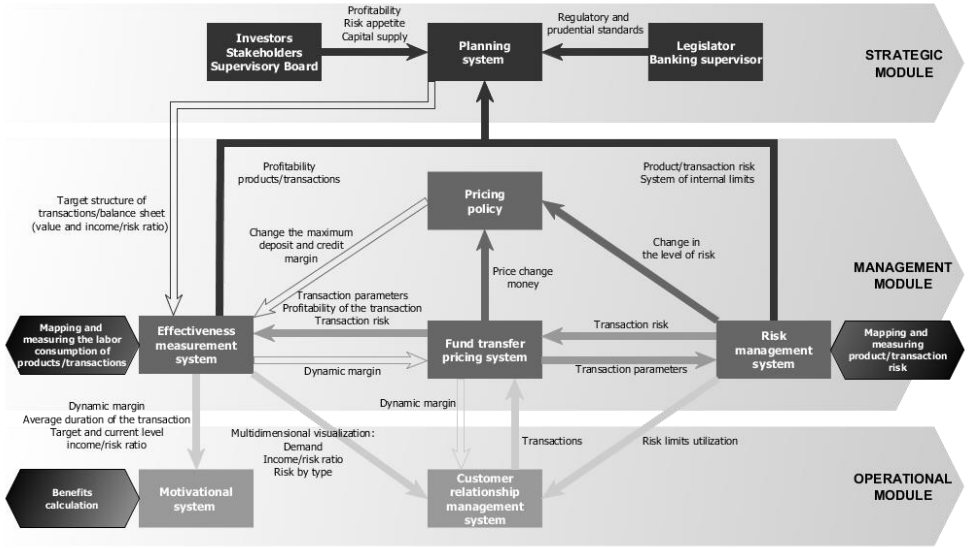
The reserve sub-account is used to settle the losses generated by the transactions effected by the seller and to collect the part of generated benefits which corresponds to the expected risk materialisation rate. The deposit sub-account is used to collect generated benefits which are to be paid out in the future, and their value depends on the average duration of the transactions effected by a given seller. The bonus sub-account is a transitional account, where benefits to be paid out in a given mouth are deposited.

According to the last formula, pay-out depends on the average duration of the transactions effected by the seller, which contributes to building a long-lasting relationship with the employee and his/her sense of responsibility for undertaken operations. Moreover, if an employee achieves a higher income/risk ratio than the target values for such transactions, the amount of benefits to be paid out increases. On the other hand, the mechanism of settling the reserve sub-account and employees' participation in covering the materialized losses should reduce the phenomena of moral hazard and adverse selection.

4.4 Functional Cross-section of the Model

The possibility of implementing the model and optimizing the bank's value with it depends on many elements (e.g., the bank's organizational structure, operating systems/processes, IT systems supporting the processes and their degree of integration). It should be noted that the multivariate of the model affects the scope of these requirements, and the best effects of the model will be achieved when using advanced methods and solutions. The systems/processes necessary in the bank, without which the implementation and implementation of assumptions and correct operation of the model are impossible, include, financial planning process, pricing policy, fund transfer pricing system, effectiveness measurement system, integrated risk management system, motivational system and customer relationship management system. The detailed mechanism of the model's operation in a functional cross-section (systems/processes) as well as the identification and flow of data necessary for its proper functioning between systems/processes (input/output data) is presented in Figure 2.

Figure 2. *The role of systems/processes in the integrated model of bank value management*



Source: *Authors' elaboration.*

5. Conclusion

The presented model is an attempt to integrate the risk management process with the bank's business activity based on the current solutions used in the banking activity and their creative synthesis enabling the automation of the bank management process. The fact that risk and profitability are considered in each module makes it possible to implement complex management of bank operations in the financial

aspect. Moreover, the modified motivational system, as well as the result allocation system (realised by FTP), increases integration of bank employees' goals at every decision-making level with the adopted strategic objectives of the bank.

In consequence, these mechanisms bring about optimization of the balance sheet/transaction structure in view of bank value maximization while maintaining the admissible level of risk (maintain the target balance between security and profitability of bank operations). Another important factor which allows us to achieve these effects is the level of bank's technological advancement. The higher the technological level, the greater the possible automation of individual modules. This, in turn, increases the potential to eliminate the human factor which related high probability of error from the process. All these elements and mechanisms should contribute to increasing bank operation effectiveness.

To recapitulate, our study allowed us to build a bank value management model, which – in terms of its concept – should be seen as yet another stage in the evolution of bank management tools and methods. Its added value is a complex approach to the issue of creating value, taking into consideration the post-crisis experience (elimination or limitation of the observed irregularities), integration of risk with the bank management system, application of technological solutions and the current scientific knowledge used in bank operations. Its modular structure and the possibility of two-directional use should also be considered an advantage, and above all, the elimination of the pro-cyclical effect of banking activity, which limits the creation of the bank's lasting value in the long term.

The model should be also seen as yet another step towards an integrated bank management system, taking into consideration the optimization mechanisms. It is also worth noting that its fundamental goal is automation of the operational management process, and – to a lesser extent – the strategic management process. The model is supposed to synthesise the current development of the banking sector in terms of application of new technologies, integration of the risk management process, use knowledge and expertise in other scientific fields (including mathematical disciplines), as well as the premises resulting from the global crisis which initiated in 2008, and from the globalization processes.

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